Rainbow Hydroelectric Facility
Great Falls Hydroelectric Facilities
On the north bank of the Missouri River
two miles northeast of Great Falls,
at the end of Rainbow Dam Road
Great Falls Vicinity
Cascade County
Montana

HAER No. MT-95

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
Rocky Mountain System Support Office
National Park Service
P.O. Box 25287
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HISTORIC AMERICAN ENGINEERING RECORD

RAINBOW HYDROELECTRIC FACILITY

HAER No. MT-95

I. INTRODUCTION

Location: The Rainbow Hydroelectric Facility is located on the north bank of the Missouri River at the end of Rainbow Dam Road, about two miles northeast of the City of Great Falls, Montana. It is one of five hydroelectric generating plants situated along a 15-mile stretch of the river. The Rainbow Hydroelectric Facility lies within the boundaries of the Great Falls Hydroelectric Facilities Historic District.

Quad: Northeast Great Falls, Mont.

UTM: Zone 12: 484770 Easting; 5264390 Northing
Zone 12: 485260 Easting; 5265020 Northing
Zone 12: 485540 Easting; 5265010 Northing
Zone 12: 485580 Easting; 5265010 Northing
Zone 12: 485350 Easting; 5264610 Northing

Date of Construction: 1908-1936

Present Owner: The Montana Power Company
40 East Broadway
Butte, Montana 59701

Present Use: Hydroelectric Facility

Significance: The Great Falls Hydroelectric Facilities Historic District is significant for its association with the industrial development of Montana and the consolidation of most of Montana's electric industry into The Montana Power Company. The district is also associated with John D. Ryan, the promoter of hydroelectric development at Great Falls. The buildings and structures are representative examples of design concepts of the period. The Rainbow Hydroelectric Facility is a contributing complex to the district.

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Butte, Montana 59701
April 1995

II. HISTORY OF THE RAINBOW HYDROELECTRIC FACILITY

A. INTRODUCTION

The Rainbow Hydroelectric Facility is located on the Missouri River about two miles northeast of the City of Great Falls, Cascade County, Montana. It is one of five hydroelectric developments situated along the Great Falls region of Missouri, a 15-mile stretch of river marked by a series of five falls and several intervening rapids (see figure 1). The Rainbow Facility downstream (east) from the Black Eagle Facility and upstream (west) from the Cochrane, Ryan, and Morony facilities. At Rainbow, the dam sits on the crest of Rainbow Falls, while the powerhouse is located about one-half mile downstream on the north bank of the river (see figure 2). Other buildings and structures associated with the facility are also on the north river bank, between the dam and powerhouse. This includes a historic operators' camp complex.

The Rainbow Hydroelectric Facility lies within the boundaries of the Great Falls Hydroelectric Facilities Historic District. Resources at Rainbow that contribute to the district are the water delivery systems, powerhouse, clubhouse, two dwellings, three garages, a swimming pool, and several structures auxiliary to power production (see figure 2). Many buildings formerly in the operators' camp have been razed over the years. Rainbow dam is a modern structure that supplanted the facility's historic timber-crib dam.

B. CONSTRUCTION OF THE RAINBOW HYDROELECTRIC GENERATING PLANT[1]

The Rainbow Hydroelectric Facility was the second hydropower development at the Great Falls of the Missouri, but was the first in the area transmitting high-voltage electricity to a distant market. The Great Falls' first hydropower development was the Black Eagle facility, built in the 1890s by the Great Falls Water Power and Townsite Company (GFWP&TC). This facility had a dam and three independent powerhouses, the largest of which supplied both mechanical and electrical power to the nearby copper reduction complex--then operated by the Boston and Montana Consolidated Copper and Silver Mining Company (Boston and Montana) of Butte.[2]

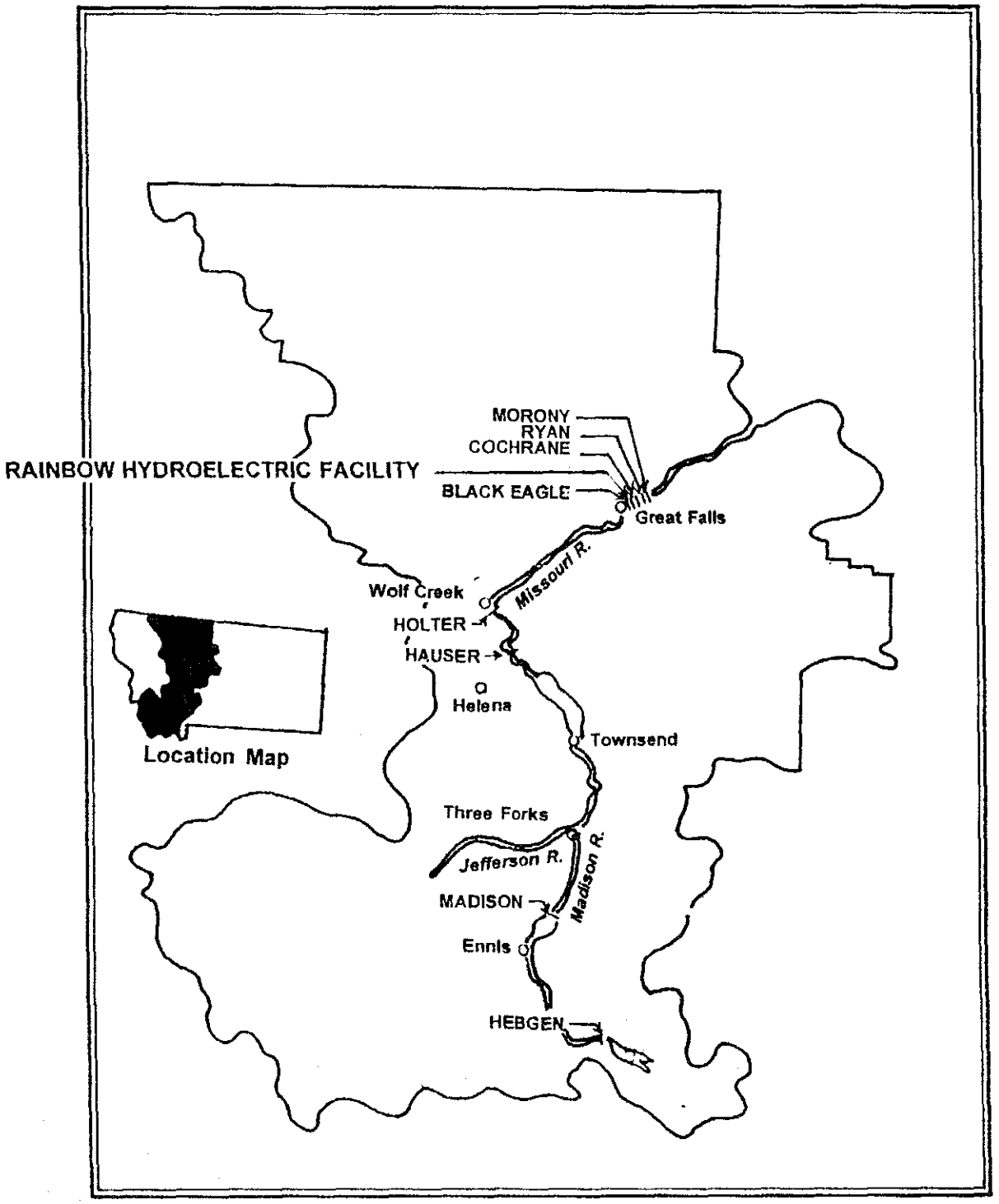
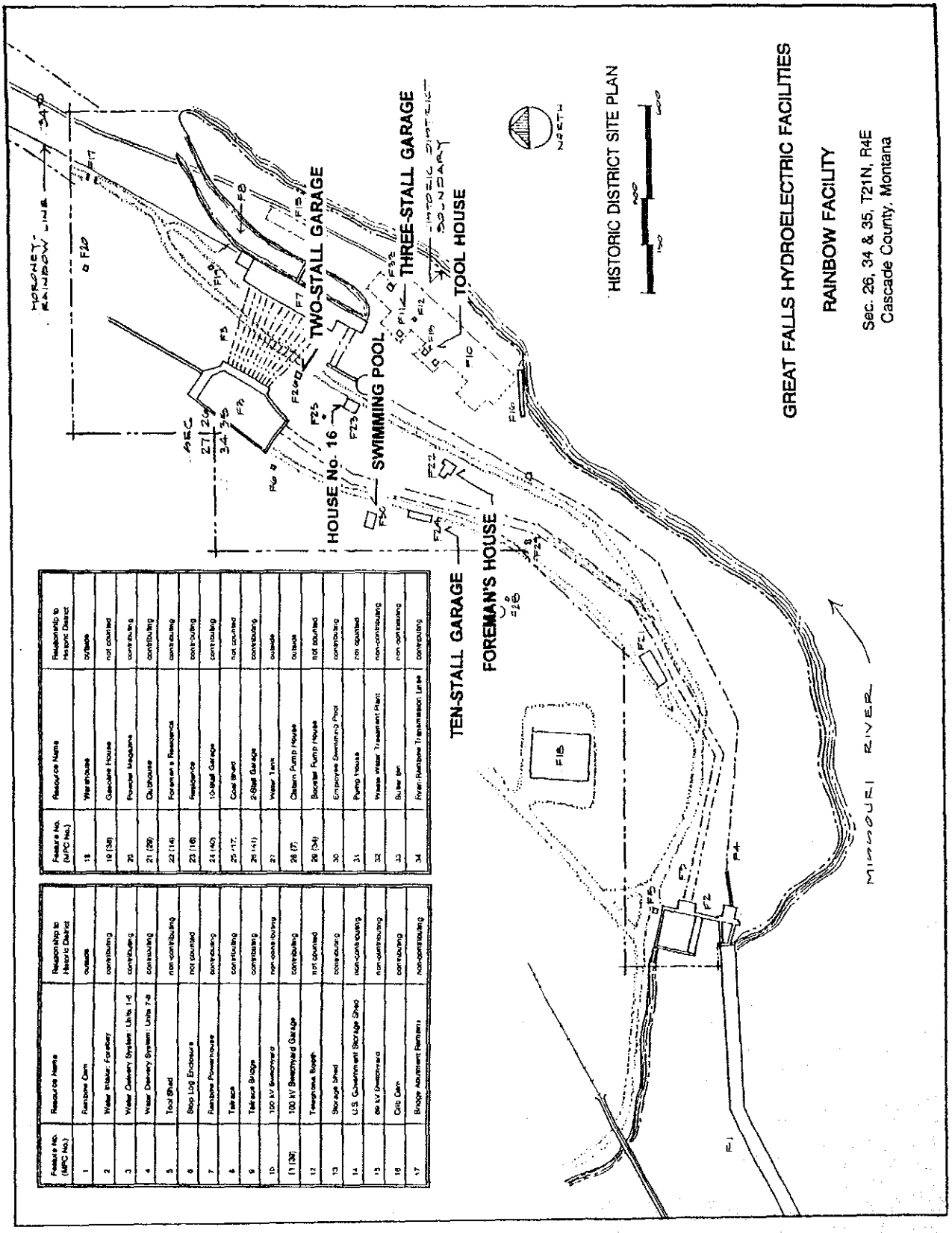


Figure 1. Rainbow Hydroelectric Facility Area Map.



Feature No. (MPC No.)	Resource Name	Relationship to Historic District
1	Rainbow Dam	outside
2	Water Intake Pavilion	contributing
3	Water Delivery System Units 1-6	contributing
4	Water Delivery System Units 7-9	contributing
5	Tool Shed	non-contributing
6	Stop Log Enclosure	not counted
7	Rainbow Powerhouse	contributing
8	Terrace	contributing
9	Terrace Bridge	contributing
10	100 kV Switchyard	non-contributing
11 (36)	100 kV Switchyard Garage	contributing
12	Telephone Booth	not counted
13	Storage Shed	contributing
14	U.S. Government Storage Shed	non-contributing
15	66 kV Switchyard	non-contributing
16	Crib Dam	contributing
17	Bridge Abutment Remains	non-contributing

Feature No. (MPC No.)	Resource Name	Relationship to Historic District
18	Warehouse	outside
19 (38)	Gasoline House	not counted
20	Powder Magazine	contributing
21 (29)	Clubhouse	contributing
22 (14)	Foreman's Residence	contributing
23 (16)	Residence	contributing
24 (40)	10-Stall Garage	contributing
25-27	Coal Shed	not counted
26 (41)	2-Stall Garage	contributing
27	Water Tank	outside
28 (7)	Obrien Pump House	outside
29 (34)	Booster Pump House	not counted
30	Emporium Swimming Pool	contributing
31	Pump House	not counted
32	Waste Water Treatment Plant	non-contributing
33	Boiler Pit	non-contributing
34	River-Rainbow Transmission Lines	contributing

Figure 2. Rainbow Hydroelectric Facility Area Map.

Despite the early success of the Black Eagle facility, Rainbow Falls and other potential power sites at the Great Falls remained untapped for many years. Hydroelectric developers in Montana instead constructed generating plants at sites closer to the copper mines at Butte and reduction facilities in Anaconda, the state's primary electrical consumers. Other early hydroelectric facilities in Montana included the Big Hole plant (1898) on the Big Hole River, the Madison plant (1902) on the Madison River, and the Canyon Ferry (1898/1902) and Hauser (1907) plants on the Missouri River.

The failure of Hauser Dam in April 1908 stimulated more extensive hydroelectric development at the Great Falls. Soon after that disaster, John D. Ryan, president of Anaconda Copper Mining Company (ACM), Montana's largest mining company, and his associates acquired the GFWP&TC and its hydropower assets. These included both developed (Black Eagle) and undeveloped sites at the Great Falls. By August, GFWP&TC had begun plans to construct a 25,000-kilowatt plant at Rainbow Falls. This plant was intended to ensure an ample and reliable supple of power for the Butte and Anaconda mining industries.[3]

To supervise the construction and design of the Rainbow hydroelectric plant, GFWP&TC retained Henry A. Herrick, the western representative for the nationally-prominent Charles T. Main engineering firm.[4] Specifications prepared by Herrick called for a low, timber crib dam above the crest of Rainbow Falls and a brick powerhouse located nearly one-half mile downstream on the north river bank. The facility's design featured a complex water delivery system comprised of a long, underground pipeline to carry water from the dam; a pressure chamber at the terminus of the pipeline; and short penstocks to deliver water from the pressure chamber to the turbines in the powerhouse.

Construction at Rainbow commenced in late August of 1908. Work crews built a road to the site and started construction of a cofferdam. Materials for the construction camp began to arrive in mid-October and by late November, the camp was equipped with a boarding house, office quarters, a blacksmith shop, and numerous sheds and warehouses. Work also progressed on a rail spur to the site, as well as a temporary steam plant to supply electricity for lighting, hoists, and compressed air to power drills and other small motor-driven machines.[5]

On December 5, laborers had set the first timbers in the main dam. Work on the structure continued throughout the winter, slowed by extreme cold and heavy snows. During the spring of 1909, construction was rushed with a night shift working under arc lighting. By May 25, enough of the dam was complete to withstand the river's spring overflow and work on the structure was halted until late September.[6]

In April 1910, the Rainbow Development neared completion. The dam and pressure chamber and flowlines were completed. The powerhouse walls were standing and installation of the turbine-generators had begun. On July 7, water filled four penstocks and two of the generators were activated. By late August, the plant was in full operation.[7]

The original Rainbow Development had six generating units, each with the capacity to produce 6,600 volts of electricity.[8] Power from two units was retained at 6,600 volts and transmitted to the nearby Boston and Montana smelter and the City of Great Falls. Power from the remaining four units was stepped up to 102,000 volts and transmitted 130 miles to Butte where a portion was stepped down to consumption voltage, and distributed to the central compressor station and the city's mines. Some of the electric current was kept at high voltage and transmitted by a single high voltage line an additional 22 miles to the Washoe Smelter at Anaconda.[9] Rainbow's generating capacity established it as "one of the important American plants that are operated at 100,000 volts or more...and a notable member of the already imposing and rapidly increasing list of plants in this country operating at 100,000 volts and over."[10]

The corporate ownership of the Rainbow Development changed soon after its completion, as Ryan and others moved to consolidate the major electric power producers in the state. In 1910, Ryan and associates dissolved the GFWP&TC and transferred the Rainbow Development and other hydropower assets to a new company, the Great Falls Power Company (GFPC). Two years later, Ryan and others formed The Montana Power Company and absorbed most of Montana's major electric utility companies. By mid-February 1913, Montana Power had also acquired majority interest in the GFPC (GFPC functioned as a subsidiary of Montana Power until 1929, when it was dissolved and all assets absorbed by Montana Power). As a result, Montana Power gained control of almost all of the electric power facilities in the state, with the bulk of the power supply provided by hydroelectric generating plants on the Madison and Missouri rivers.[11]

In 1917, the Rainbow Hydroelectric Facility was upgraded to take advantage of the increased minimum average water flow of the Missouri afforded by Hebgen Dam, a storage facility near the headwaters of the Madison River. Two additional turbine-generators were installed at the plant, increasing its total capacity to 35,000 kilowatts. A large addition to the powerhouse housed the new units. Other improvements required by the upgrade project included a new intake structure at the dam and an additional water delivery system, comprised of a 14-foot diameter, wood stave flowline and a steel surge tank. [12]

C. OPERATORS' CAMP AT THE RAINBOW HYDROELECTRIC FACILITY[13]

At most turn-of-the century hydroelectric plants on the Missouri and Madison rivers in Montana, construction camp buildings saw continued use as residential facilities once a plant went into operation. On-site living quarters for operators and their families was often a necessary component due to the isolated location of most hydroelectric plants as well as the need for immediate employee response in case of an accident. In the early 1910s, however, officials of the newly-formed Montana Power realized that the company's housing needs at hydroelectric sites could not be adequately met by construction camp buildings which, in general, had been hastily constructed with little thought for comfort or long-term use. Consequently, Montana Power embarked on a program of constructing permanent housing at its hydroelectric sites. This construction effort peaked during the late 1910s and early 1920s. By the mid-1930s, permanent employee housing was available at almost all of the Company's hydroelectric plants.

Montana Power's operators' camps varied noticeable in size and configuration from plant to plant, but most utilized the same basic building types. Most of the housing needs were met with groups of small, frame bungalows; somewhat larger bungalows were often provided for supervisory personnel. Bungalows were similar in design to contemporary working-class housing in nearby Montana communities. In general, they exhibited a commonality of design, suggesting that standard Montana Power blue prints were employed. Although the houses were far from ostentatious, limited architectural detailing helped make the buildings more attractive. Many of the late 1910s and 1920s houses, for example, displayed bracketed eaves and other qualities typifying the then-popular Craftsman style.

During the 1920s and 1930s, new development at the operators' camps was not limited to housing but also included other building types and structures that further enhanced the quality of living at the plants. The automobile's increasing popularity led to construction of garages; many of these small structures featured pedimented false-fronts. At some plants, large brick "clubhouses" were added, providing apartments for unmarried workers as well as meeting and recreational facilities. Swimming pools also appeared at two of the Company's facilities. Formal landscaping features were also gradually added at many complexes. These landscaping projects included lawns, tree and flower plantings, stone retaining walls, and other structures.

The operators' camp at Rainbow was highly typical of the evolution and growth of residential facilities at hydroelectric sites on the Madison and Missouri rivers in the early twentieth century. After the facility went on-line in 1910, the boardinghouse and office quarters built during the construction phase served as housing for plant

operators. These buildings were soon supplanted by permanent housing, including a "Foremen's House," built in 1911 and three cottages added soon after formation of Montana Power in 1913. From the late 1910s to the mid-1930s, several more buildings and structures were constructed at the camp which, in effect, established it as a cohesive, small community. During this period, the camp received eight new houses, a large two-story clubhouse, at least three garages, and an employee swimming pool. Meanwhile the grounds of the camp were landscaped with formal lawns and flower beds, stone retaining walls, and a grape arbor and fountain in front of the Clubhouse.[14] Following the 1930s, no new construction occurred at camp and it retained its configuration and general appearance for several decades.

III. Endnotes

1. This section is largely derived from the National Register of Historic Places Registration Form for the "Great Falls Hydroelectric Facilities," by Renewable Technologies, Inc., May 1991.

2. "Great Falls Water Power and Townsite Company," report on file at Record Services, The Montana Power Company, Butte, n.d., pp. 1-6.

3. Ibid., 8; *Great Falls Tribune*, 24 August 1908.

4. Ibid.

5. "Construction of the Rainbow Power Development," report on file at the office of William O'Keefe, Rainbow Shop, The Montana Power Company, Great Falls, n.d.

6. Ibid.

7. Ibid.

8. For contemporary descriptions of the Rainbow Facility see: Warren Aikens, "Hydro-Electric Power in the Butte-Anaconda District," Mining and Engineering World 37 (November 1912): 987-991; "Developments at the Great Falls Power Company," Electric World 60 (June 1912): 37-42; and "The Rainbow Falls Hydroelectric System, " Electric World 60 (July 1912): 2.

9. Aikens, "Hydro-Electric Power," 991.

10. "The Rainbow Falls Hydroelectric System," 2.

11. Frank W. Bird, *The Story of Montana Power* (Butte: The Montana Power Company, 1941) 43-44.

12. Ibid., 44.

13. Unless otherwise noted the following section is taken from the National Register of Historic Places, Multiple Property Documentation Form entitled "Hydroelectric Generating Facilities on the Missouri and Madison Rivers in Western Montana," by Renewable Technologies, Inc. and Ethnoscience, May 1991.

14. Montana Power Company, "Reclassification of Electric Plant, January 1, 1937," vol. 1, report on file at Record Services, The Montana Power Company, Butte; Cecil Kirk, "Reclassification: Engineer Check of Cost Analysis, Rainbow Plant, 1939-1940," report on file at Record Services, The Montana Power Company, Butte.

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"Developments at the Great Falls Power Company." *Electric World* 60 (July 1912): 37-42.

Great Falls Tribune. 24 May 1908.

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Kirk, Cecil. "Reclassification: Engineering Check of Cost Analysis, Rainbow Plant, 1939-1940." Report on file at Record Services, The Montana Power Company, Butte.

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Renewable Technologies, Inc., and Ethnoscience. "Hydroelectric Generating Facilities on the Missouri and Madison Rivers in Western Montana." National Register of Historic Places, Multiple Property Documentation Form. May 1991.

"The Rainbow Falls Hydroelectric System." *Electric World* 60 (July 1912): 2.